



# APA QC Summary

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- Brief intro to the database organization
- Requirements for APA QC summary document
- Changes to the DB to facilitate filling the document
- Example of the document
- Summary

- The database is set up to create a record of each APA and each item that goes into an APA, in the DB jargon those are called “components” and there is a form for each type of component
- The intake process for each component creates a unique ID/DUNE PID for the component and records relevant information such as its drawing/part number and where compliance related information is stored in EDMS
- We also track everything that happens to a component using forms known as “actions”
- For the production of frames and assembled APAs, we create a list of actions that must be done in order and call that list the “workflow”
- The DB creates a time-ordered list of every action associated with each component, what folks with more experience in industry than me call the traveler
- The work described today creates an executive summary of that traveler document for assembled APAs

# Goals for the APA QC Executive Summary



- The requirements for the APA QC executive summary are
  - The document must be auto-generated, which means we have to store the relevant information in the database during the production phase
  - The document must pull in relevant information from the components going into the APA - ie provide access to information about the frames, mesh, wire, etc
  - The people checking each critical point of the production must be easily identified in the document
  - Any non-conformances, including missing wires/channels, for the APA must be listed
  - The summary should be no longer than a few pages



- The initial workflows for frames and APAs were missing some final steps, specifically a final QC sign-off
- Here is the proposed sign-off for frames

Please review the full summary of all actions performed on this frame to verify all checks requested have been completed.

Person verifying the frame is ready to be assembled into an APA \*

This field captures the name of the person signing off that all QC checks have been performed prior to the frame being used in an APA. Treat it as a digital signature.

QC Checks Performed \*

- Frame Assembled According to Released Procedures
- Survey is Conformant
- Fasteners Torqued Properly
- Frame is Clean
- No Sharp Edges
- Vendor Documentation is in EDMS
- Non-conformances Reviewed

The frame cannot be used in an APA without all boxes being checked.

Non-Conformance Sign-off \*

Names of responsible persons who reviewed NCRs and agreed the APA can be used as-is. If this APA has no NCRs enter "NA"

Comments

Please describe any special circumstances related to this APA

- A designated person must indicate they have verified a frame is ready for use including all indicated checks were performed
- The frame traveler page will be very helpful for this task
- If the frame has an NCR a designated person must verify that is acceptable
- Are there other items to include in the checks?



- Here is the proposed sign-off for assembled APAs

Please review the full summary of all actions performed on this APA to verify all checks requested have been completed.

Person verifying the APA is ready to leave the factory \*

This field captures the name of the person signing off that all QC checks have been performed prior to the APA leaving the factory.  
Treat it as a digital signature.

QC Checks Performed \*

- Boards QC'ed Before Acceptance into Inventory
- Mesh QC'ed Before Acceptance Into Inventory
- Frame QC'ed Before Acceptance into Inventory
- Wire Strength Meets Requirements
- Wire Tensions Meet Requirements
- Winder Maintenance Validated Before Start of Each Layer
- Winder Tension Controls Validated Before Each Layer
- Electrical QC Checks Performed for Each Layer
- APA Survey is Conformant
- Protection Properly Installed
- APA Properly Installed in ASF
- APA Assembled According to Released Procedures
- Non-conformances Reviewed

The APA cannot leave the production facility without all boxes being checked

Non-Conformance Sign-off \*

Names of responsible persons who reviewed NCRs and agreed the APA can be used as-is.  
If this APA has no NCRs enter "NA"

Comments

Please describe any special circumstances related to this APA

- A designated person must indicate they have verified the APA is ready to leave the factory
- The APA traveler page will be very helpful for this task
- If the APA has an NCR a designated person must verify that is acceptable
- Are there other items to include in the checks?



- We also needed to include some new fields in existing action forms
- Name of person checking the mesh installation for an APA
- People who validated the winder was ready to go and operator for each layer
- Replaced wires and bad solders for each layer
- Do we want similar fields for checking the QC of the PD rails and cables and RTDs and cables?

Mesh Panel Installation QC Check By

Name of person performing QC of panel installation

Winder Maintenance Verification

Name of the person certifying the winder is in operational condition

Tension Control Verification

Name of person certifying the tension controls are ready for winding

Data Grid

Winder Operator \*

Winder Operator \*

Who is operating the winder for this layer? Add rows for each operator

Replaced Wires - Either due to Break or Tension out of Tolerance

Side	Layer	Board Location	Board Position Number	Solder Pad Number
Side	Layer	Board Location	Board Position Number	Solder Pad Number
<input type="text"/>	G	<input type="text"/>	<input type="text"/>	<input type="text"/>

Only record one end point for the wire

Bad Solder Joints

Side	Layer	Board Location *	Board Position Number *	Solder Pad Number *
Side	Layer	Board Location *	Board Position Number *	Solder Pad Number *
<input type="text"/>	V	<input type="text"/>	<input type="text"/>	<input type="text"/>



- The APA component page has a link to view and print the summary
- The summary is best viewed as a pdf, but formatting is still fine on-line
- Top of the summary includes the DUNE PID, production site, configuration and QR code to component page

## View Component Information

**Component Type**  
Assembled APA [Create New Component of This Type](#)

**Component UUID**  
771c6190-5328-11ee-a909-710b0099b932 [Copy](#)

**Component Name**  
D00300100002-001000-US175-01-00-00

**Component Data:**  
This is version 1 of the component, and it was last edited on September 14th 2023, 5:59:54 PM by [Brian Rebel](#)

**Frame UUID** \*

8d471c22-7304-11ec-93da-001a4af11e32

[Click here for this component's information page](#)  
UUID of the frame used for this APA

**APA Assembly Location** \*

Chicago

Where is this APA being assembled?

**APA Configuration** \*

Bottom

**DUNE PID**

D00300100002-001000-US175-01-00-00

**APA Number At Location** \*

1000

Of the APAs to be made at this assembly location, which number is this one?

All Versions: >

[Edit Component](#) [View JSON Record](#) [Print a set of the component's QR codes](#) [View and print the component's summary](#) [View and print this APA's executive summary](#)



## Assembled APA Executive Summary

**DUNE PID**  
D00300100002-00002-UK106-01-00-00

**Production Site**  
Daresbury

**Configuration**  
Bottom

**Component UUID**  
[bc12d190-6e6b-11ee-98d0-0717e5499ad5](#)

This summary generated on: November 7th 2023, 2:51:51 PM





- Next comes the high-level QC sign-offs with links to relevant action forms
- Then comes the tension information for each layer, including number of replaced wires and bad solders
- Do we want both plots in the summary?
- There are links to the winding related actions which contain information about the wire and bobbins

QC Signoffs

Completed APA QC Review by: James T Kirk [APA QC Review Details](#)

Completed Frame QC Review by: Brian Rebel [Frame QC Review Details](#) [Frame Survey Details](#)

Mesh Panel Installation QC by: Gerard Bell [Mesh Panel Installation QC Details](#)

Conduit Insertion QC by: Krish Majumdar [Cable Conduit Insertion QC Details](#)

Wire Layer U

Winder: UK Winder 2

Winder Maintenance Signoff: Gerard Bell

Tension Control Signoff: Krish Majumdar

Number of Replaced Wires: 1

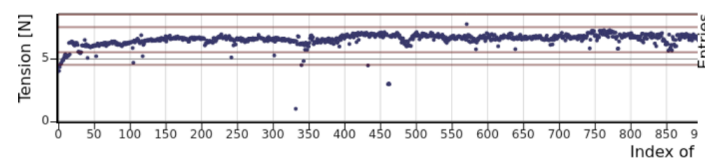
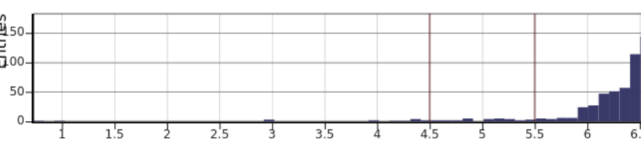
Number of Bad Solders: 2

[Winding Details](#) [Soldering Details](#) [Tension Measurements](#)

Tension Measurements (Side A)

4.01,4.01,4.33,4.54,4.61,4.74,4.94,4.87,5.07,5.26,5.34,5.1,5.12,5.23,5.22,6.24,5.33,6.3,6.28,6.36,6.31,6.15,6.08,6.04,6.25,6.15,6.25,6.08,5.54,5.55,5.46,5.43,5.51,6.04,6.07,6.03,6.03,6.48,5.98,6.15,5.98,5.05,6.05,5.95,5.96,5.89,5.94,!

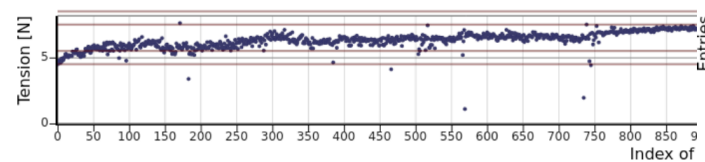
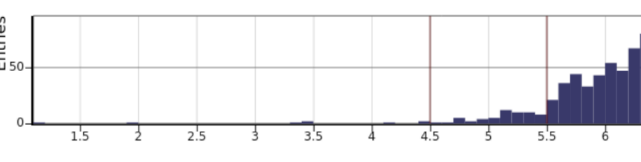
Entries: 1141  
Min.: 0.73  
Max.: 8.40  
OoB (IL): 43  
OoB (IH): 16  
OoB (OL): 15  
OoB (OH): 0  
NaNs: 0

Tension Measurements (Side B)

4.48,4.78,4.72,4.81,4.59,4.94,4.71,4.96,4.81,4.94,5.05,5.25,5.27,5.06,5.14,5.02,5.18,5.11,5.15,5.15,5.11,5.46,5.43,5.37,5.31,5.36,5.57,5.62,5.3,5.19,5.25,5.34,5.04,5.06,5.32,5.13,5.3,5.12,5.41,5.67,5.6,5.63,5.48,5.83,5.66,5.77,5.34,5.

Entries: 1141  
Min.: 1.10  
Max.: 8.00  
OoB (IL): 66  
OoB (IH): 3  
OoB (OL): 8  
OoB (OH): 0  
NaNs: 0



Assembled APA - Wire Non-Conformances					
	Layer & Side:	Head Board & Pad:	Endpoints:	Cold Channel:	Offline Channel:
<a href="#">DB Page</a>	AX	01-02	Side Board 1-Side Board 2	03-04-05	1204
<a href="#">DB Page</a>	BX	06-07	Side Board 6-Side Board 7	08-09-10	1907

- Next comes the wire non-conformances with a complete listing of wire location and offline channel number
- I suggest we have a single wire NCR form per APA that is updated as we go (versions are retained)
- Finally we list the remaining NCRs for the APA, the links take one to the forms where the full description and photos are available

Other Non-Conformances	
Component: Assembled APA	Description: Some problem with the geometry boards
Type: Geometry Board Issue	

<a href="#">DB Page</a>	Component: APA Frame	Description: Survey not up-to-date ... using CERN datapoints instead of PSL
	Type: Survey	

- We have a draft executive summary of the QC information for the APAs ready to be deployed
- To deploy the code we need to also deploy updated forms used to fill the summary
- We have opted to include links to forms in many places of the summary rather than replicating the information in those forms
- We can include more fields in the summary, but every additional field makes the summary longer and potentially less useful
- There are a few questions we could answer now:
  - Do we want both tension related plots in the summary?
  - Do we need PD rail/RTD QC sign-offs in the summary?
  - What other QC information do people think is missing?